Chapter Two: Property Description, Geology and Petroleum Potential

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A. Property Description

The study area lies partially within the Denali Borough and the Fairbanks North Star Borough roughly between T3N and T7S, R5W and R14W, north and west of the City of Nenana. The mineral estate in the Nenana basin is predominately state-owned, although some of it is land the state has selected under the Statehood Act that has not yet been conveyed to the state. Some of the mineral estate is owned by Doyon Limited, a regional Native corporation, and cannot be included in an exploration license (Figure 2.1). There are also Native allotments within the boundary of the license area to which the federal government has retained the mineral rights, which cannot be included in the license area.

The state owns approximately 1.25 million acres of the subsurface estate within the study area and Doyon Limited owns approximately 78,200 acres of the subsurface estate. Village corporations (surface estate owners) include Seth de Ya-Ah Corporation (Minto) and Toghottehle Corporation (Nenana).

Toghottehle Corp. has approximately 7,400 acres remaining in its entitlement from the Alaska Native Claims Settlement Act (ANCSA). The corporation has selected approximately 17,920 acres within the study area, but has yet to make the final determination as to which of those acres it wants to receive title. Once Toghottehle makes its final selections and the land is conveyed by BLM, Doyon becomes the mineral estate owner. The state has topfiled (made selections under the Statehood Act) on this same acreage. Toghottehle will have first choice in selecting acreage; the lands not conveyed to Toghottehle will go to the state.

The exploration license proposal included the state-selected but unconveyed acreage, which cannot be included in an exploration license until the state has received title. If, during the term of the license, some of the acreage on which the state has topfiled or the mineral estate of the Native allotments are conveyed to the state, the licensee may request to have the selected acreage that was identified in the licensee's application included in the license. If including the acreage in the license would result in the license surpassing the 500,000-acre limit for an exploration license, the licensee must relinquish other acreage in order to bring the license into compliance.

The study area is used for subsistence, personal use and sport hunting and gathering and recreation. Authorized state land uses include leases, scientific research sites, commercial recreation, trapping cabins, personal use cabins, guide camps, cross-country travel, easements, RS2477s, material sites and assignments to other agencies. There are nine state land disposal areas (subdivisions, homesites, and remote parcels) within the study area (ADNR, 2001). Private land holdings include subdivisions, homesites, Native allotments, homesteads, and mining claims (ADF&G, 1985b:875).

B. Surface and Subsurface Ownership

There are two types of interests or ownership in land: the surface estate and the subsurface or mineral estate. In many areas of the United States an original owner may hold an interest in both the surface and subsurface estates. This is especially true when the original owner was a settler or homesteader. The interests may become separated when an original owner keeps only the surface estate and sells (or leases) the subsurface, or when an owner sells only the surface and keeps the subsurface to sell or use later. Therefore

surface and subsurface interests may be separate, and a property or homebuyer could buy land but acquire only the surface estate.

In United States common law, the subsurface estate is the dominant estate. However, the subsurface interest must give "due regard" to the surface estate owner and the surface owner might be entitled to compensation for property damage.

When Congress was debating the Alaska Statehood Act, a major concern expressed was how the new state, which was one of the poorest in the country, could support itself since it did not have an industry. As a result, the Alaska Statehood Act allowed the state of Alaska to select from the federal public domain 104 million acres of land as an economic base for the new state. The Act also granted to Alaska the right to all minerals underlying these selections and specifically required the state to retain this mineral interest when conveying interests in the surface estate. The Statehood Act provided that if Alaska disposed of its mineral estate contrary to the Act it would have to forfeit that mineral estate to the federal government. The lands offered for exploration licensing contain lands in which the state owns both the surface and subsurface estate, and lands where the state owns only the subsurface while the surface might be either privately owned or held by the borough.

Under Alaska state law AS 38.05.125, licensees of oil and gas interests have the right to enter upon the surface estate for the purposes of exploration and development. However, a licensee of the subsurface must give "due regard" to the surface estate owner and may not enter the surface estate until the licensee makes a good faith effort to reach agreement with the surface estate owner on a settlement for damages that might be caused by license activities (AS 38.05.130). If an agreement cannot be reached, the licensee may enter upon the land in exercise of the state's reserved rights only after posting a surety bond for an amount determined to be sufficient by the director of DO&G. Governmental powers to regulate oil and gas activity are discussed in Chapter One. AS 38.05.130 contains information regarding bonding requirements.

C. Minto Flats State Game Refuge

The study area encompasses all but the northernmost portion of the Minto Flats State Game Refuge (MFSGR, “Minto Flats”), which encompasses approximately 500,000 acres (Figure 2.2). Minto Flats has traditionally been and remains an important area for harvesting fish, wildlife, and other resources for Athabaskan Indians living in Minto and Nenana (Lindberg, 2002 citing to Shepherd and Matthews, 1985). There are a number of Native Allotments located within the refuge (Figure 2.3). The Minto Flats is also an important fish and wildlife use area for Fairbanks area residents. It has one of the highest waterfowl harvests in the state and provides a relatively large proportion of statewide waterfowl hunter days (ADF&G, 1998).

The MFSGR was established by the Alaska Legislature in 1988 to: (1) ensure the protection and enhancement of habitat; (2) ensure the conservation of fish and wildlife; and (3) guarantee the continuation of hunting, fishing, trapping, and other uses by the public compatible with the protection and enhancement of habitat and the conservation of fish and wildlife (AS 16.20.037(b)). The establishing statute had been silent in regards to allowing oil and gas activities within the refuge until this year, when HB527 was signed into law on June 21, 2002. This legislation added the following subsection to AS 16.20.037:

> *(h) Entry upon the Minto Flats State Game Refuge for purposes of exploration and development of oil and gas resources shall be permitted unless a person demonstrates, on the basis of sound science or local traditional knowledge, that exploration and development is incompatible with the purposes specified in (b) of this section.*

ADNR and ADF&G jointly manage the refuge and, in accordance with the MFSGR Management Plan adopted in 1992, oil and gas exploration and development may be allowed in the refuge on a case-by-case basis if it is determined to be compatible with the purposes for which the refuge was established. Authorized activities: (1) shall be subject to permit terms and conditions necessary to uphold those purposes, (2) shall require minimal surface use and (3) may be seasonally restricted.

Within the study area, the refuge comprises approximately 428,160 acres. Of that, approximately 311,680 acres are located north of the Tanana River. Within this northern portion ADF&G has identified a core area that comprises 277,760 acres (89 percent of the northern portion). Additional mitigation measures may be required for activities within the refuge, especially within the core area. ADF&G and ADNR will make final decisions on the compatibility of any specific proposed oil and gas exploration or development activity or facility within the MFSGR on a case-by-case basis and may, on a site-specific basis, find a proposal incompatible with the refuge's purposes and management plan due to very high resource values and well-established patterns of human use of those resources at that locale.

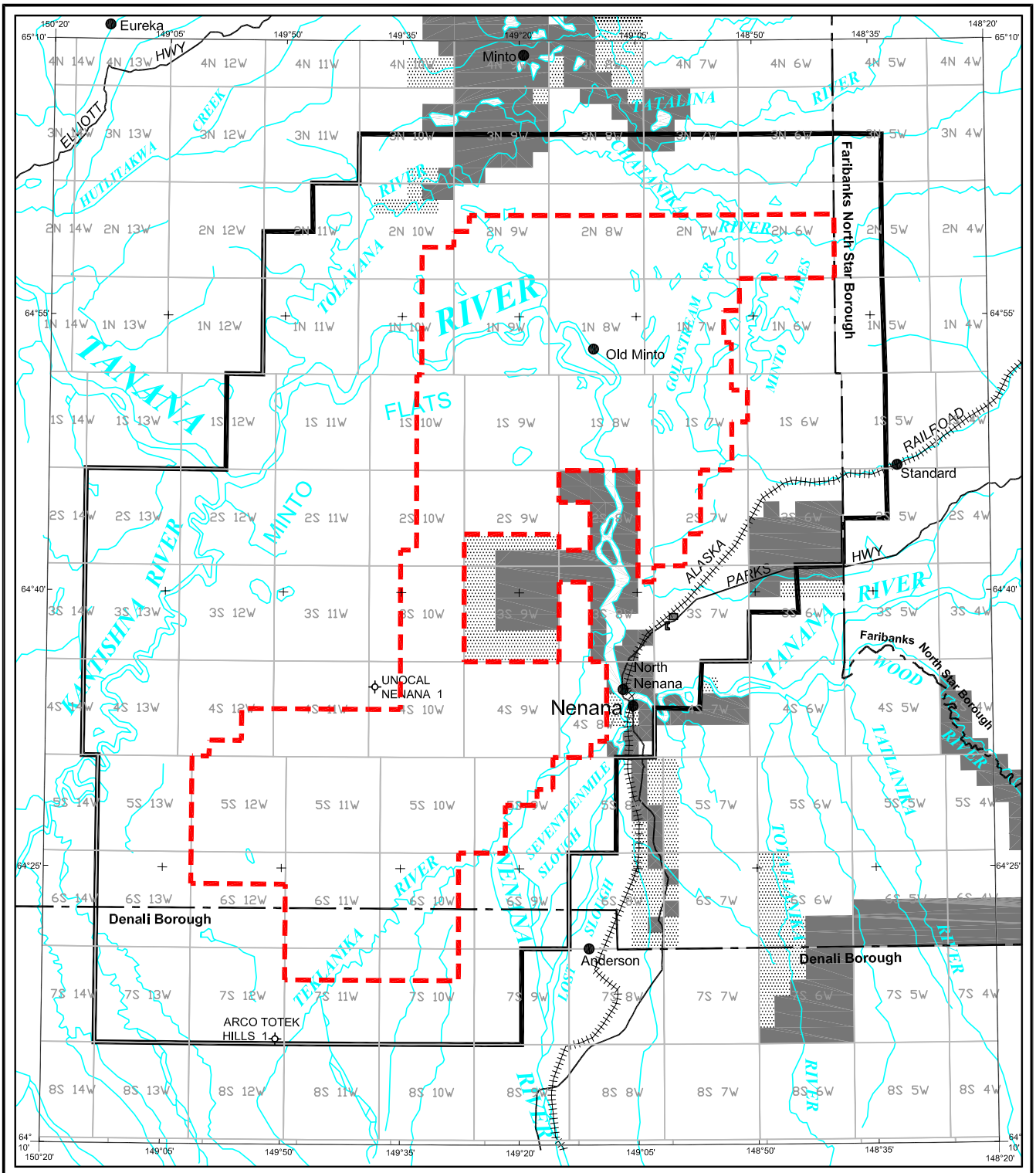

FIGURE 2.1 Native Lands Subsurface Ownership

Map Area

Nenana Basin Study Area = License Area =

Native Lands: Conveyed = Selected =

10 0 10 20 Miles 30

10 0 10 20 30 Kilometers

Source: Doyon, 2001.

Map created, edited, and published by the State of Alaska, Department of Natural Resources, Division of Oil and Gas.

Albers Equal-Area Conic Projection, 1927 North American Datum, Clarke 1866 ellipsoid with a central meridian of 149° 20' 00", origin latitude of 50°, northern parallel of 65°, and southern parallel of 55°.

This is not an official tract map, but is for informational purposes only. DNR makes no claim as to its accuracy.

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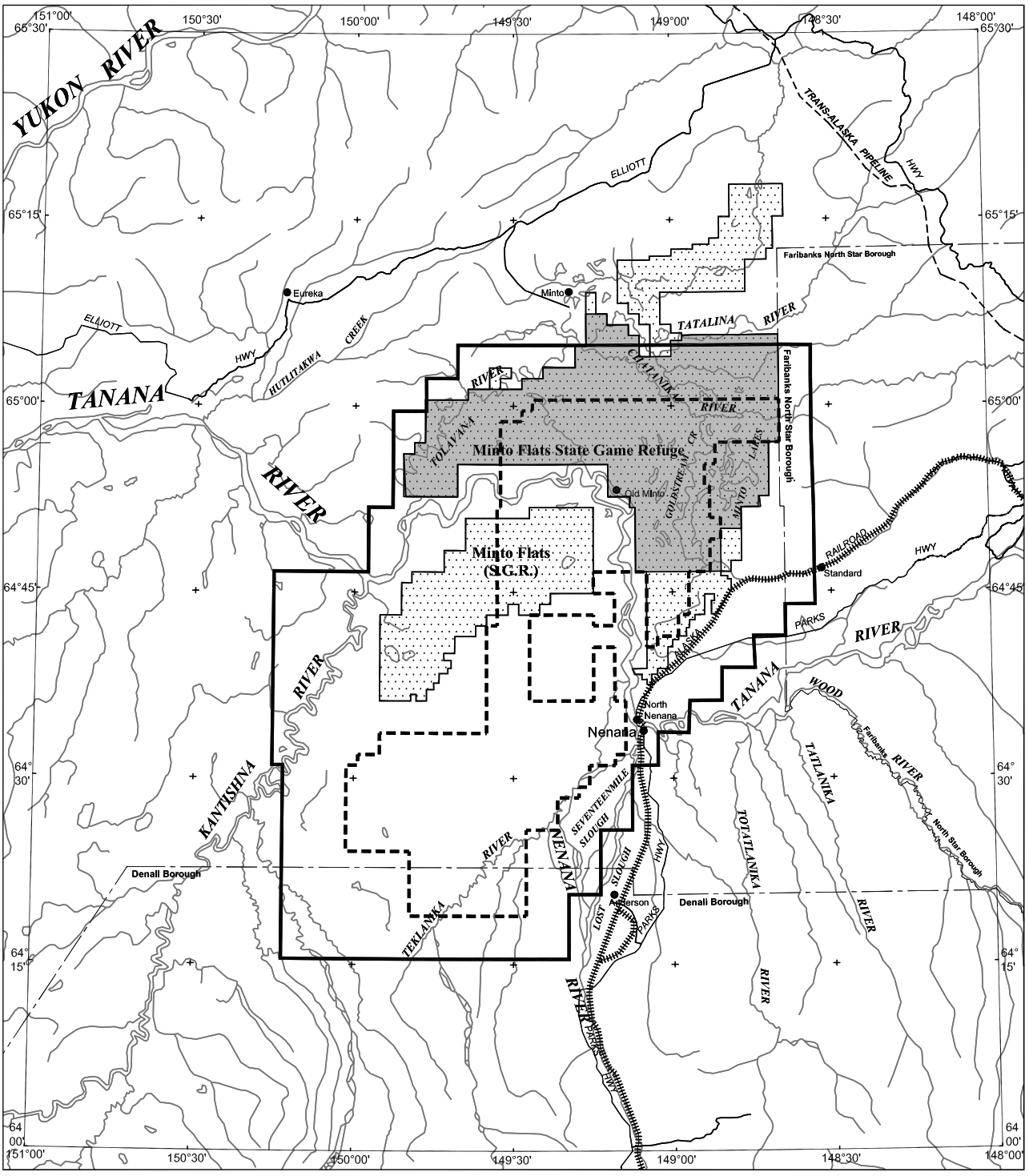


FIGURE 2.2 Minto Flats State Game Refuge

Nenana Basin Study Area = License Area =

Minto Flats State Game Refuge = MFSGR Core Area =

Source: ADF&G, 2002.

Map Area

SCALE 1:750,000 One Inch Equals 12 Miles Approx.

10 0 10 20 30 40 50 Miles

10 0 10 20 30 40 50 60 Kilometers

Map created, edited, and published by the State of Alaska, Department of Natural Resources, Division of Oil and Gas.

Albers Equal-Area Conic Projection, 1927 North American Datum, Clarke 1866 ellipsoid with a central meridian of 149° 30', origin latitude of 50°, northern parallel of 65°, and southern parallel of 55°. ADNR 7/02

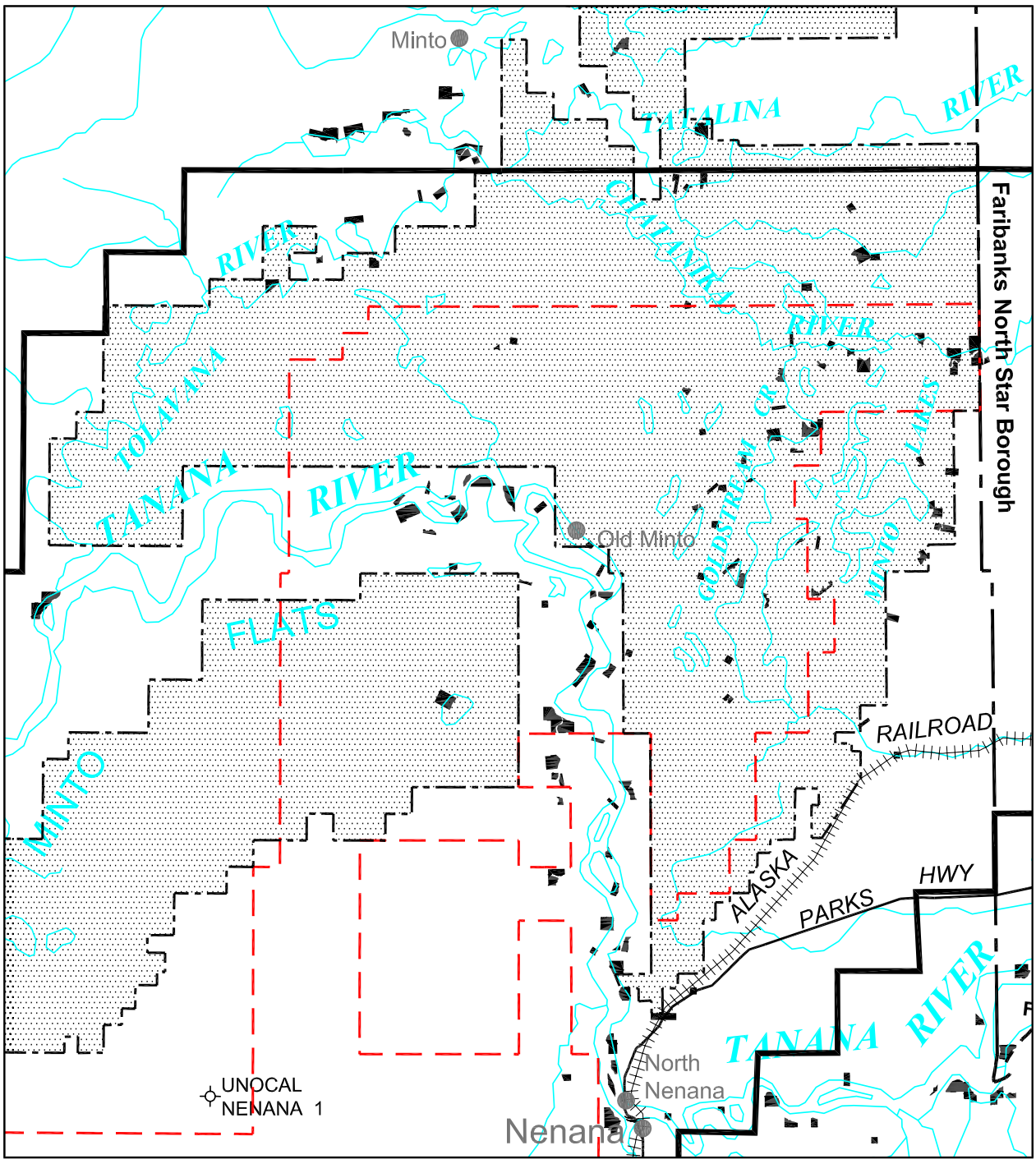
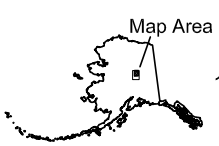


FIGURE 2.3 Native Allotments Within Minto Flats State Game Refuge



Nenana Basin Study Area = License Area = MFSGR =

Native Allotments = Source: Doyon, 2001.

10 0 10 20 Miles

10 0 10 20 Kilometers

Map created, edited, and published by the State of Alaska, Department of Natural Resources, Division of Oil and Gas.
Albers Equal-Area Conic Projection, 1927 North American Datum, Clarke 1866 ellipsoid with a central meridian of 149° 20' 00", origin latitude of 50°, northern parallel of 65°, and southern parallel of 55°.
This is not an official tract map, but is for informational purposes only. DNR makes no claim as to its accuracy.
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D. Geology

The Nenana basin is a northeast trending elongate alluvial basin encompassing approximately 8,500 mi^2. The village of Old Minto is located near the northern end of the basin. A swampy lowland drained by the Kantishna and Tanana Rivers, surficial deposits typically consist of Quaternary glacial, lacustrine and alluvial deposits.

Table 2.1 Geologic Time

Eras	Periods	Epochs	Began Approximate Number Years Ago
Cenozoic	Quaternary	Holocene (Recent)	10,000
		Pleistocene (Glacial)	1 million
	Tertiary	Pliocene	7 million
		Miocene	25 million
		Oligocene	40 million
		Eocene	60 million
		Paleocene	68-70 million
Mesozoic	Cretaceous	Late and Early	135 million
	Jurassic		180 million
	Triassic		225 million
Paleozoic	Permian		270 million
	Pennsylvanian		325 million
	Mississippian		350 million
	Devonian		400 million
	Silurian		440 million
	Ordovician		500 million
	Cambrian		600 million

AEIDC, 1974:37

Gravity and seismic data indicate that the Nenana basin structure and extents are closely related to a series of northeast-southwest trending fault splays that occur as the Tintina fault system, which borders the basin on the northeast, transitions into the Kaltag fault system, which borders the basin on the northwest. The basin structure is characterized by a series of northeast trending grabens or half-grabens associated with the Minto fault and other local faults that occur at the northwest terminus of the Tintina fault system. The sedimentary basin fill consists of as much as 16,000 feet or more of non-marine Quaternary and Tertiary sediments lying above a Jurassic metamorphic basement (Figure 2.4).

The prospective sedimentary section, thought to be time-equivalent to the productive Kenai Group in the Cook Inlet, consists of sands, gravels, conglomerates, shales and coals. Extensional faults and horst blocks appear to be present and may have controlled the occurrence and distribution of possible reservoir facies during deposition of the basin-fill. Structural, stratigraphic and combination traps are likely to occur throughout the basin.

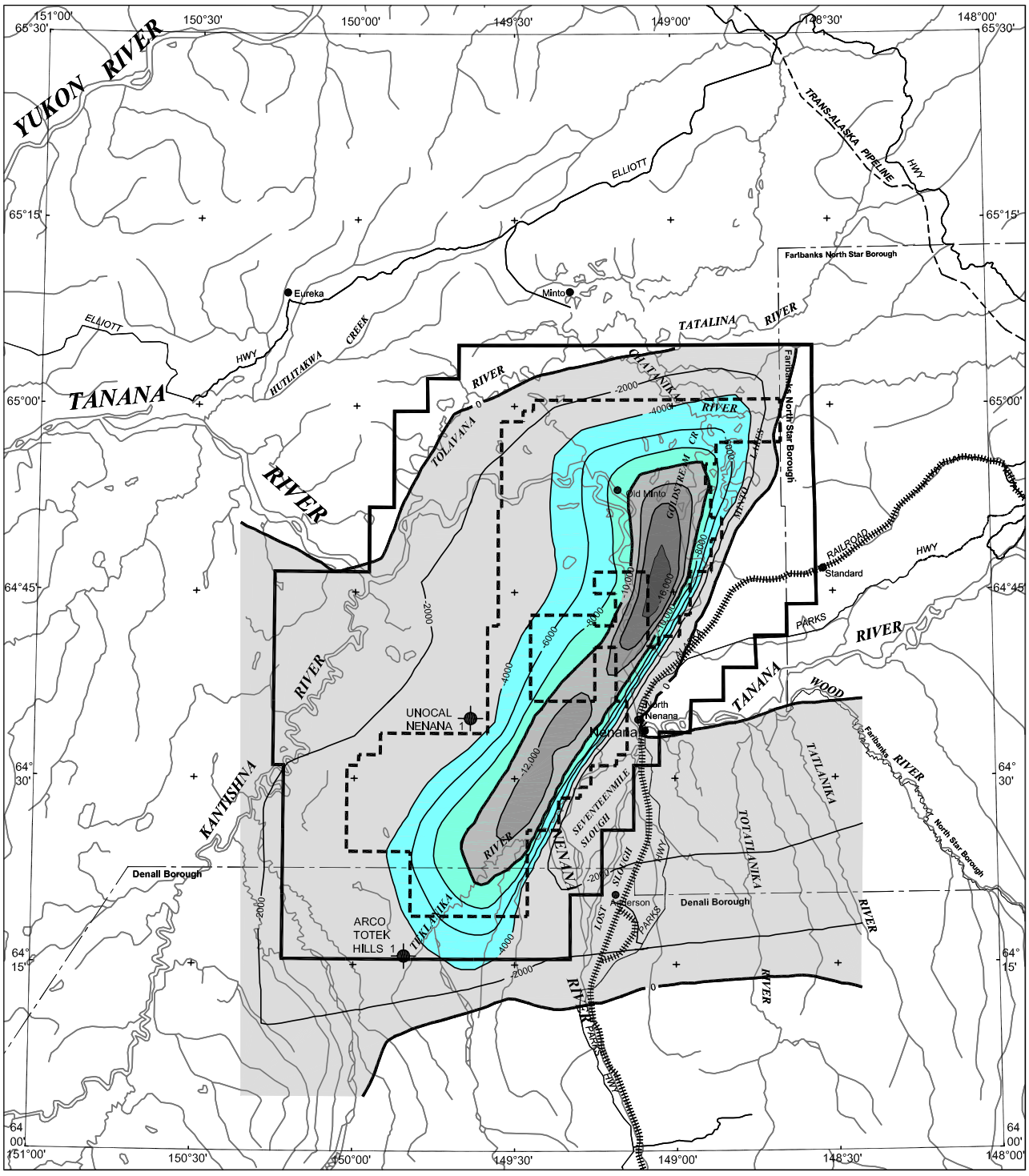

FIGURE 2.4 Thickness of Sedimentary Basin (Tertiary)

Nenana Basin Study Area = License Area =

Exploratory Wells =

Map Area

SCALE 1:750,000 One Inch Equals 12 Miles Approx.

10 0 10 20 30 40 50 Miles

10 0 10 20 30 40 50 60 Kilometers

Source: DO&G, 2002.

Map created, edited, and published by the State of Alaska, Department of Natural Resources, Division of Oil and Gas.

Albers Equal-Area Conic Projection, 1927 North American Datum, Clarke 1866 ellipsoid with a central meridian of 149° 30', origin latitude of 50°, northern parallel of 65°, and southern parallel of 55°.

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E. Exploration History

The basin is relatively unexplored in that only two relatively shallow exploration wells were drilled in the central and southern portion of the study area. Some seismic data have been acquired from these portions of the study area. The northern area remains undrilled at this time, and no seismic data have been gathered in this region. The seismic data are of proprietary nature and, beyond what has been disclosed in other publications, cannot be discussed in this finding. The Division of Geological and Geophysical Surveys, the Division of Oil and Gas and the United States Geological Survey, however, have acquired extensive gravity data across the area, which is publicly available.

The Unocal Nenana #1 well was drilled to a total depth of 3,062 ft. before being plugged and abandoned in 1962. The ARCO Totek Hills #1 was drilled to a total depth of 3,590 ft. before being plugged and abandoned in 1984. Except for minor amounts of gas associated with coal beds, no hydrocarbon shows were observed in the wells. Reports of oil seeps in the basin are unconfirmed.

F. Petroleum Potential

Based on the limited subsurface information that is available, the Nenana basin is thought to be gas-prone, particularly in and around the margins of its deeper areas, which are considered to be the most prospective for finding hydrocarbon accumulations. The two wells drilled thus far did not penetrate the deeper more prospective strata in the basin nor did they test representative traps. Oil is normally generated in marine shales, and no marine source rocks have been found within the basin. While the lacustrine shales, where buried deeply enough, might generate oil, they might be too thin to produce oil in substantial volume. Oil seeps reportedly located near the mouth of the Nenana River along the flanks of the basin are considered to be doubtful or disproved, as are several other reported seeps located east of the study area (Troutman and Stanley 2002, citing to Miller et al.). Therefore, the oil potential of this basin is considered to be low.

However, the significant volume of coal present in the basin suggests that natural gas is more likely to be encountered in commercial quantity than is oil. Sand, gravel and conglomerate, all potential reservoir rocks, appear to be present in abundance in the subsurface. There is potential for reservoir traps in intra-basinal, horst block structural highs and stratigraphic traps and coalbed methane reservoirs around the basin margins. Reservoir rocks are Paleocene to Eocene lacustrine/alluvial fan sequence, Eocene to Oligocene fluvial sequence, and Oligocene to Pliocene coal-bearing sequence. Source rocks are possibly Paleocene to Eocene lacustrine shales. Tertiary coal-bearing strata serve as both a source for conventional gas and as a coalbed methane reservoir. ADNR believes that the gas potential of this basin ranges from moderate to good.